Chapter 10

Environmental Health and Safety

10.1 Primary Issues

This chapter evaluates environmental health issues related to arsenic, cadmium, and lead, as identified by the analysis team and by concerned citizens. Since southern Vashon and Maury Islands have a mantle of topsoils that have been contaminated by airborne arsenic from past smelter operations in Ruston, protection of public health is a project issue.

The primary issues analyzed in this chapter are:

- Would mining remobilize the existing arsenic in the site topsoils as air contamination and dust?
- Would mining remobilize the existing arsenic in the site topsoils as surface water contamination?
- Would the arsenic be present in soils to be sold and exported from the site?
- Would arsenic enter groundwater as a result of the proposal?
- Would tug propeller wash stir up contaminated sediments and harm endangered fish species or other marine life?

10.2 Affected Environment

10.2.1 Background

The Lone Star site is approximately 5 air miles from the now-closed ASARCO smelter. The operation of this smelter, from approximately 1890 to 1985, distributed fallout containing arsenic, cadmium, and lead in surrounding areas, including Maury Island and the Lone Star site.

The ASARCO smelter facility and the immediate vicinity has been designated an EPA Superfund site (this designation did not encompass the Vashon/Maury Island area). Site closure and remedial measures are well underway at both the smelter site and the neighborhoods surrounding the smelter.

A series of studies have been performed on the distribution and exposure pathways due to the arsenic contamination left as a result of the smelter operation. For the Vashon/Maury Island area, the defining document is the Ruston/Vashon Arsenic Exposure Pathways Study prepared in 1987 by the School of Public Health and Community Medicine at the University of Washington (referred to as "the Pathways Study" in this chapter).

Additional studies and background information used for the EIS analysis include:

- The Potential Water Quality Impacts and Mitigations report and the Soils, Geology, Geologic Hazards, and Groundwater Report prepared for the environmental checklist (AESI 1998a and 1998b). Both of these reports have been and remain available for public inspection at the Vashon Community Library.

- A revised addendum report on groundwater that includes additional groundwater testing established from new monitoring wells established for this EIS analysis (AESI 1999). This report has also been placed for public inspection at the Vashon Community Library and was provided to the Vashon/Maury Island Community Council.

- An additional evaluation of onsite arsenic, including new testing completed for this EIS by Terra Associates in 1999. The memorandum reporting Terra's findings is included in Appendix B of this EIS.

The results of these studies are described in the following section.

10.2.2 Existing Contaminant Distribution

Based on direct testing on the project site, and on previous studies (as cited in text), approximately the top 18 inches of soils at the site contain arsenic, lead, or cadmium concentrations above natural levels (see Table 10-1 and Figure 10-1). This is not surprising since the material arrived at the site through aerial fallout from the ASARCO smelter, leaving what is called a "mantle" of contaminants on the surface.

Of the three contaminants evaluated for this EIS (arsenic, cadmium, and lead), only arsenic is found above levels requiring cleanup actions under the Model Toxics Control Act (MTCA). While lead and cadmium are present in elevated levels in the top 18 inches of soil, they are not above the cleanup levels defined in the MTCA (see Table 10-1). Therefore, the following discussion focuses mainly on arsenic concentrations.

Much of the surface soil at the site contains arsenic levels well above what would be expected to occur naturally. Natural levels of arsenic in western Washington range from 1 to 7 parts per million (ppm) (Ecology 1994), while studies conducted for this EIS found levels of arsenic in project site topsoils ranging from 6 to 330 ppm (see Appendix B). Studies conducted by Landau Associates (1999) and AESI (1998b) also found elevated levels of arsenic in the topsoils at the site. Elevated arsenic levels occur throughout Vashon and Maury Island, as documented by the University of Washington in the Pathways Study. This study found levels ranging from 2 to 290 ppm.

The amount of arsenic within some topsoils at the site exceeds cleanup levels established by the EPA for the ASARCO cleanup in Ruston and North Tacoma, as well as industrial cleanup levels defined in the MTCA. During the EPA evaluation and cleanup of the area nearest the ASARCO smelter, within the Ruston/North Tacoma study areas, EPA set an “action” level at 230 ppm for arsenic. The action level was that which required removal or containment of contaminated soils to protect human health. Under the MTCA, the limit for arsenic is 20 ppm in residential areas and 200 ppm for industrial areas. Since the project site is zoned and managed as a mining site, it falls under the industrial area classification of the MTCA.

In contrast to the contaminant concentrations found in surface soils, subsurface sand and gravel deposits on the site (the material that would be exported from the site) contain natural levels of arsenic, lead, and cadmium, based on direct testing of these materials. “Natural” levels are those that occur naturally throughout the Puget Sound region. As shown in Table 10-2, none of the subsurface samples analyzed contained elevated levels of these contaminants (sample locations are shown in Figure 10-2).

Likewise, groundwater levels of these contaminants at the Lone Star site and throughout Vashon/Maury Islands are also within natural levels, based on the direct testing done at the site and on previous testing conducted by the University of Washington (1987) and others. Natural levels in western Washington can range up to

0.020 ppm, or twice at high as the highest amounts found in Vashon/Maury Island aquifers (Cargill pers. comm.). Testing conducted by AESI (1999) found arsenic levels in groundwater on the project site to range between 0.002 and 0.004 ppm (the MTCA groundwater cleanup level is 0.005 ppm). The University of Washington tests for the Pathways Study identified levels at less than 0.010 ppm. Prior groundwater testing summarized by Carr and Associates (1983) and Vashon-Maury Island Groundwater Management Committee (1998) also found groundwater levels of arsenic, lead, and cadmium to be within natural limits on Vashon and Maury Islands.

Surface water on the site is essentially absent, so none is contaminated. Rain tends to quickly percolate into the porous sand and gravel deposits at the site. Some drainage was observed along roadsides during heavier rainfall events. However, overall there is no significant surface water on the site and, therefore, no contaminated surface water.

10.3 Impacts

10.3.1 Would mining remobilize the existing arsenic in the site topsoils as air contamination and dust?

10.3.1.1 Proposed Action

The applicant proposes to excavate materials that have been exposed to arsenic fallout from 1890 to 1995. Since falling on the site, the arsenic has remained relatively stationary in a shallow "mantle" over the site, being concentrated in the uppermost levels of the topsoils and declining with depth, with little arsenic present below 18 inches. The arsenic has chemically bound to organic materials in the topsoil, and does not easily wash out of the soil with water.

In its current state, the arsenic poses relatively little danger to anyone off the site, since it is essentially trapped in firm soils contained by roots. The primary risk would be to people using the site, with direct contact with contaminated soils being the biggest concern.

However, with continued mining at the site, these soils would be excavated, removed, and contained each time a previously undisturbed area is prepared for mining. During this containment process, contaminated materials would be in contact with the air and, therefore, vulnerable to being blown away as dust. Chapter 3, Air Quality, describes how the operator would be required to prepare a dust control plan in consultation with the Puget Sound Air Pollution Control Agency (PSAPCA). However, because of concerns regarding arsenic, additional measures must be taken to address potential impacts from dust generated from contaminated soils. These measures are described in the mitigation section of this chapter, and include covering exposed materials and limiting soil clearing operations to 2-acre parcels at any one time.

With these mitigation measures in place, significant risks to the environment or human health would be effectively mitigated.

10.3.1.2 Alternatives 1 and 2

The risk of arsenic becoming airborne would be effectively mitigated under either of the action alternatives for the same reasons stated for the Proposed Action.

10.3.1.3 No-Action

No impact would occur even though limited mining would continue under No-Action. The applicant would still be required to manage soils at the site according to measures prescribed by Ecology, since this issue has been brought to the attention of the applicant, the public, and Ecology.

10.3.2 Would mining remobilize the existing arsenic in the site topsoils as surface water contamination?

10.3.2.1 Proposed Action

Because there are no streams or other surface water on the site, arsenic or other contaminants cannot travel off the site via surface water flows.

In addition, direct laboratory testing of arsenic-tainted soils from the site has demonstrated that arsenic at the site is in a stable form, being bound tightly to surface soils. Tests included leachability analyses of the highest concentrations found during testing (leachability is the ability of a material to be washed down through soils with rainwater). These analyses showed the site arsenic deposits are highly resistant to leaching (see Appendix B). The fact that sampling also showed that arsenic has stayed within the top 18 inches of soils further demonstrates that the arsenic is not very leachable.

Finally, the applicant is proposing to contain contaminated soils (see Appendix C). With such containment, the end result of the project would include remediation of the site, with arsenic being contained rather than mobilized.

10.3.2.2 Alternatives 1 and 2

Arsenic would not enter the surface waters under either of the action alternatives for the same reasons stated for the Proposed Action.

10.3.2.3 No-Action

Under No-Action, limited mining would continue, but again, for the reasons already presented, arsenic would not enter surface waters.

10.3.3 Would the arsenic be present in soils to be sold and exported from the site?

10.3.3.1 Proposed Action

Under the Proposed Action, contaminated soils will be segregated from materials that will be exported. Sampling has demonstrated that the sands and gravels proposed for export from the site have only naturally occurring levels of arsenic, cadmium and lead. Contaminated materials would be contained onsite, as described in the mitigation section later in this chapter.

10.3.3.2 Alternatives 1 and 2

Arsenic would not be exported from the site under either of the action alternatives for the same reasons presented for the Proposed Action.

10.3.3.3 No-Action

Under No-Action, limited mining would continue, but again, for the reasons already presented, arsenic would not be transferred off the site.

10.3.4 Would arsenic enter groundwater as a result of the proposal?

10.3.4.1 Proposed Action

Mining at the site, as proposed, would not result in arsenic entering the groundwater. The primary fact that leads to this conclusion is that arsenic is tightly bound to topsoils at the site. Arsenic has not entered the groundwater or subsurface sand and gravel deposits in the over 70 years since arsenic first drifted onto the site from the ASARCO smelter. Testing of groundwater conducted by Carr and Associates, Geraghty and Miller, and AESI, and tests of the Gold Beach water supplies, show that groundwater levels of arsenic are within natural levels on Vashon/Maury Islands.

Furthermore, laboratory testing confirmed that the arsenic is in a non-leachable form, so even though contaminated soils would be moved about the site, the arsenic would still be tightly bound to the soils and would not wash down to the groundwater. The bonds that hold the arsenic in the soil are chemical and would not be altered by mixing or disturbance associated with clearing and containment of the topsoil layer as part of site preparation.

Finally, the applicant is proposing to completely contain contaminated soils onsite, using a lined and covered containment cell, as described under mitigation and in Appendix C.

10.3.4.2 Alternatives 1 and 2

Arsenic would not enter the groundwaters under either of the action alternatives for the same reasons stated for the Proposed Action.

10.3.4.3 No-Action

As with the Proposed Action, no impacts on groundwater are expected. While mining activity is assumed to be much lower under No-Action, the applicant would still operate under an agreement with Ecology, and such an agreement is considered sufficient to avoid significant groundwater impacts.

10.3.5 Would tug propeller wash stir up contaminated sediments and harm endangered fish species or other marine life?

10.3.5.1 Proposed Action

Residents in the area have raised this question. The likelihood of this occurring is negligible for several reasons. First, the deposition of arsenic through water is not nearly as direct as that through air. Arsenic that was deposited on the waters of Puget Sound was greatly diluted and moved about by wave action and currents.

Second, the sands and sediments themselves are subject to much greater agitation and movements than are terrestrial soils. Wave action causes beach sands to move along shorelines (a process called littoral drift). Winter storms also mix and wash sands away, thereby diluting arsenic into very low amounts.

Third, the tugs are not expected to cause significant amounts of sediment disturbance. The tugs would be positioned in deep water, with propeller wash directed either parallel to or away from the shoreline and, in many cases, would be located on the seaward side of the barge. They would not stir up significant amounts of sediment.

With all of these considerations, arsenic risks to endangered fish or other marine life would not significantly change due to barging.

10.3.5.2 Alternatives 1 and 2

Propeller wash would not cause arsenic-related impacts on endangered fish species or other marine life for the same reasons stated for the Proposed Action.

10.3.5.3 No-Action

Under No-Action, barging would not occur. There would be no concerns regarding arsenic and propeller wash.

10.4 Mitigation Measures

10.4.1 Measures Already Proposed by the Applicant or Required by Regulation

10.4.1.1 Soils Management Plan

At the request of King County, the applicant has prepared a draft soils management plan to allow public and agency review and comment on proposed measures. The draft management plan (Appendix C) proposes to contain contaminated soils in a lined and covered containment cell located on the north side of the property. No topsoils would be removed from the site.

Following public and agency review of the draft soils management plan, King County will require that the applicant complete a final soils management plan to be included as part of the Final EIS. The plan shall be accepted and approved by King County prior to issuance of a permit for mining above current levels at the site.

Over the course of mining at the site, about 271,000 cubic yards of materials containing arsenic above residential cleanup levels (as defined under the Model Toxics Control Act [MTCA] Method A) would be excavated and contained. Of this total volume, approximately 50,520 cubic yards would contain arsenic concentrations that are also above industrial cleanup levels (again, using MTCA Method A). These soils above industrial cleanup levels would be managed in a separate phase of the cell that contains thicker or otherwise bolstered covers and linings.

The containment cell would be built along the north side of the property in phases (see Figure 10-3). At full capacity (when mining is complete), the berm would measure up to 30 feet high and 2,100 feet long. The berm would have clean soil placed on top of it, and it would be vegetated. As recommended in Chapter 5, native vegetation would be preferable.

Construction of the berm would proceed north to south. A typical cross-section in the north-south direction is shown on Figure 10-4 and a typical profile in the east-west direction is shown on Figure 10-5.

While a bottom liner is not required for inert and demolition waste per WAC 173-304-461, a liner and cover would be installed in the containment cell. A single layer of geosynthetic clay liner (GCL) is proposed. GCLs are made with a layer of refined clay, with permeabilities of 1×10^{-8} to 10^{-9} centimeters per second, bound between layers of geotextile. A GCL is considered equivalent to 2 to 4 feet of clay with 1×10^{-7} centimeter per second permeability. GCL is recommended over one layer of geosynthetic membrane because defects in membranes or membrane seams can result in leakage. The clay in GCLs would swell as it is exposed to water and this swelling action closes possible openings in the liner.

To protect the GCL liner from damage during installation and construction, a layer of bedding sand 6 inches thick would be placed over the subgrade to protect the liner from puncture by the gravelly soil. The bedding sand would be screened to remove all material larger than 0.5 inch.

The GCL would then be covered with a 6-inch layer of drain sand. The drain sand should consist of material with 100 percent finer than 0.5 inch and less than 3 percent finer than the U.S. No. 200 sieve (0.003 inches).

A 6-inch-diameter perforated pipe would be installed along the north (downslope) side of the cell. This drain would lead to a manhole on one end of the cell. The purposes of this drain are to prevent build-up of water over the liner and to provide a sampling location. A 2-inch-diameter perforated pipe would be installed in the bedding sand (under the liner) along the north side. This would also lead to a manhole on one end of the cell and could be used to monitor water under the liner.

The contaminated soil would be placed over the drain sand. The soil would be placed in horizontal layers and compacted to 90 percent density. The purpose of placement and compaction is to provide a stable slope and firm support for the final cover. Trees and brush would be removed from contaminated areas prior to excavation of contaminated soil. The trees and brush would not be placed into the containment cell (since their decay would generate water). The contaminated soil may contain some natural organic materials such as roots and vegetation, but not sufficient amounts to generate significant water.

The cover would provide the same barrier to infiltration as the liner. The applicant proposes a single-layer synthetic membrane or GCL for the cover. The base for the membrane would be screened soil with 100 percent finer than 0.5 inch. The base sand could be contaminated soil that has been screened. A flexible membrane would be suitable for the cover because the cover is less susceptible to physical damage than the liner. A flexible membrane would be covered with a geotextile fabric to protect it from damage.

The cover would be covered with a 6-inch layer of screened drain sand or synthetic drain layer, the same as used over the liner. The drain layer would then be covered with 18 inches of soil, then the surface would be vegetated. Topsoil would not be required as long as the cover soil has sufficient nutrients to support a healthy vegetation cover. The vegetation is needed to prevent surface erosion and for aesthetics.

The containment cell would be constructed in steps to match mine operation. The first step would start at the downslope (north) end, to collect rainwater infiltration and potential leachate. The first step is expected to take soil from Phase 1 and 2 of the mine operation (or about 46,000 cubic yards of contaminated soil). During soil placement, temporary berms would be constructed upslope to divert rainfall runoff from entering the cells. Some rainfall runoff would seep into the sand drain layer over the GCL during soil placement. This water would drain into the perforated pipe at the downslope side.

Any water collected from the berm would be tested and handled according to procedures outlined in the MTCA.

10.4.1.2 Air Emission Control Methods

Air emission control methods would be implemented during all excavation and cleanup activities that have the potential to generate air pollutants. These methods include the use of controlled excavation methods, wetting, material covering, housekeeping, vacuuming, and use of covered trucks.

10.4.1.3 Dust Monitoring Plan

The applicant has proposed to monitor ambient air quality on the property perimeter during cleanup activities at the site. The ambient air-monitoring plan would describe the basis of design for the monitoring program; general program procedures; air sampling procedures; meteorological monitoring procedures; laboratory methods; and references.

The objectives of the air-monitoring plan would be to:

1. Monitor ambient air quality for potential pollutants related to onsite activities.

2. Quantify potential offsite transport of project-related emissions.

3. Assess the effectiveness of onsite emission control methods used during excavation and cleanup activities.

As part of the monitoring program, a “wind rose” will be generated based on annual data obtained from the closest meteorological station. (A wind rose is a graphic showing the frequency and strength of wind from various directions in a given area.) The results of this wind rose will be used to develop air quality sampling station locations at the site.

As a conservative assessment of particulate matter (dust) emissions, sampling will be conducted for total suspended particulate (TSP) for comparison to the PM10 action level (see Chapter 3 for discussion of PM10). PM10 is only a portion of the TSP, so a measurement for TSP will always include a greater range of particulate matter than would a PM10 measurement.

Lead and arsenic concentrations will also be assessed by collection of particulate matter on TSP filters for total lead and arsenic analysis.

Air quality action levels would be used as an indicator of the effectiveness of onsite emission control methods used during excavation and cleanup activities. In the event that single data point concentrations exceed the action limit criteria, a contingency plan detailing additional control measures would be implemented. The action levels for the potential air pollutants monitored will be established in conjunction with the Puget Sound Air Pollution Control Agency, King County Health Department, and the Washington State Department of Ecology.

10.4.1.4 Worker Safety

Workers onsite must have sufficient training and safety equipment to control their potential exposure to soil contaminants during site clearing and restoration. Exposure monitoring must be done during topsoil management to determine if the action level is reached or exceeded. If the action level of 5 micrograms per cubic meter (averaged over an 8-hour period) is exceeded, additional engineering controls and worker protection will be required by state law. The additional measures could consist of workers wearing respiratory protection or using additives to further stabilize the soils and reduce dust generation.

10.4.2 Additional Measures for Consideration to Further Reduce Impacts

10.4.2.1 Additional Dust Control Measures

The following measures would reduce risks associated with arsenic leaving the site as dust during soil extraction and containment procedures:

- Contaminated soils should be cleared and collected in manageable phases. No more than 2 acres of contaminated materials should be exposed at any one time.
- Contaminated soils should be covered while being temporarily stockpiled or transported to the containment cell. Soils should be transported by covered truck, rather than by conveyor or open-bed truck.
- Temporary covers should be placed over contaminated material within containment cells prior to final sealing of the cell.

10.5 Cumulative Impacts

Since site soils can be managed to avoid significant impacts, the Proposed Action and alternatives would not result in cumulative impacts to environmental health and human safety.

10.6 Significant Unavoidable Adverse Impacts

None expected with the mitigation identified in this chapter.

10.7 Citations

10.7.1 Printed References

AESI. See "Associated Earth Sciences, Inc."

Associated Earth Sciences, Inc. 1998a. Soils, geology, geologic hazards and groundwater report, existing conditions, impacts and mitigation, Maury Island Pit, King County, Washington. Included as Appendix A to: Huckell/Weinman Associates, Inc. 1998. Expanded environmental checklist for Northwest Aggregates Maury Island mining operation. May.

Associated Earth Sciences, Inc. 1998b. Potential water quality impacts and mitigations, Maury Island Pit, King County, Washington. Included as Appendix B to: Huckell/Weinman Associates, Inc. 1998. Expanded environmental checklist for Northwest Aggregates Maury Island mining operation. May.

Associated Earth Sciences, Inc. 1999. Draft addendum geology and groundwater report. Maury Island Pit, King County, Washington. March 3. Prepared for Lone Star Northwest, Inc.

Bechtel Environmental, Inc. 1992. Feasibility study report, Ruston-North Tacoma. January. Submitted to U.S. Environmental Protection Agency Region X Superfund Branch.

Carr and Associates. 1983. Vashon/Maury Island water resources study. December 1. Prepared for King County Department of Planning and Community Development.

Ecology. See “Washington Department of Ecology”.

Foster Wheeler Environmental Corporation. 1999. Letter to Northwest Aggregates regarding Maury Island arsenic data. January 19.

Hydrometrics, Inc. 1994. Revised work plan for excavation and removal of soils, Ruston and North Tacoma, Washington. December 6. Prepared for ASARCO, Inc.

Landau Associates. 1999. Letter to Vashon-Maury Island Community Council regarding final sampling results: NW Aggregated Maury Island Gravel Mine. January 19.

University of Washington. 1987. Final report, Ruston/Vashon arsenic exposure pathways study. March 31. School of Public Health and Community Medicine. Prepared for Washington Department of Ecology.

Vashon-Maury Island Groundwater Management Committee. 1998. Final Vashon-Maury Island groundwater management plan. December.

Washington Department of Ecology. 1994. Natural background soil metals concentrations in Washington State. (Publication 94-116.) October.

10.7.2 Personal Communications

Cargill, Daniel. Washington State Department of Ecology. January 22, 1999.

Voytilla, Marykay. U.S. Environmental Protection Agency. January 11, 1999.

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Table 10-1. Analytical Test Results for Surface Soil Samples on the Lone Star Site (ppm)[a]

Sample Number	Site Type[c]	Surface			9-Inch Depth			18-Inch Depth		
		Arsenic	Cadmium	Lead	Arsenic	Cadmium	Lead	Arsenic	Cadmium	Lead
1[b]	F	**330***	2	830	37	0.84	27	43	0.66	19
2	F	120	2.3	390	25	1.2	10	8.7	0.56U	5.6U
3	F	150	0.79U[d]	280	110	0.91	81	10	0.62	8.6
4	F	160	1.5	450	19	0.72	25	4.2	0.53U	5.3U
5	F?	47	0.92	54	47	0.84	59	43	0.63U	51
6	F	100	9.3	470	**270***	2.9	120	64	1.1	30
7	F?	17	0.58U	13	19	0.56U	18	13	0.53U	11
8	F	190	3	550	67	0.94	41	10	0.58U	7.6
9	F	98	1.6	510	110	0.95	30	9.2	0.77	7.1
10	GP	4.3	0.53U	5.3U	1.6U	0.53U	5.3U	1.6U	0.52U	5.2U
11	GP	1.9	0.53U	5.3U	1.6U	0.55U	5.5U	1.6U	0.53U	5.3U
12	F?	6.1	0.54U	5.8	6.2	0.54U	5.4U	5.7	0.55U	6
13	F	**220***	1.2U	470	130	0.82	45	8.2	1.5	8.3
14	F	18	0.91	70	130	1.2	37	2.0U	0.92	36
15	GP	1.6U	0.53U	5.3U	1.6U	0.53U	5.3U	1.6U	0.53U	5.3U
16[b]	F	**280***	1.6	730	39	0.84	17	40	0.89	23
17	F	61	6	240	**260***	1.2	35	11	0.52U	5.2U
18	GP	11	0.59U	7.1	8.2	0.57U	5.7U	5.9	0.57U	6.1
19	F	100	6	470	**270***	1.4	67	3.8	0.59U	5.9U
20	F	140	5.4	710	11	0.59U	11	7.6	0.59	6.6
MTCA[e]		200	10	1,000	200	10	1,000	200	10	1,000

* Exceed MTCA Method A cleanup values for industrial sites.
[a] All units are parts per million (ppm), milligrams/kilogram.
[b] Sample No. 16 is a field replicate of Sample No. 1
[c] Site Type F is forested area; Site Type F? is forested area but has signs of recent grading or disturbance; Site Type GP is in the area of the existing gravel pit.
[d] U indicates that the metal was not detected at the stated detection limit.
[e] MTCA cleanup values shown are Method A for industrial sites.

Table 10-2. Analytical Test Results for Sand and Gravel Samples on Lone Star Site (ppm)[a]

Sample Designation	Sample Location	Arsenic	Cadmium	Lead
EP-15 @ 9	Exploration Pit EP-15, 9 feet below ground surface, sample of sand beneath surficial till soils.	4.3	0.58U[b]	5.8U
EP-16 @ 10	Exploration Pit EP-16, 10 feet below ground surface, sample of sand beneath surficial till soils.	4.5	0.54U	5.4U
EP-17 @ 8.5	Exploration Pit EP-17, 10 feet below ground surface, sample of sand beneath surficial till soils.	2.7	0.61U	6.1U
EP-18 @ 10	Exploration Pit EP-18, 10 feet below ground surface, sample of sand beneath surficial till soils.	2.4	0.53U	5.3U
EP-19 @ 10	Exploration Pit EP-19, 10 feet below ground surface, sample of sand beneath surficial till soils.	3.9	0.54U	5.4U
EP-20 @ 10	Exploration Pit EP-20, 10 feet below ground surface, sample of sand beneath surficial till soils.	2.4	0.54U	5.4U
EP-21 @ 10	Exploration Pit EP-21, 10 feet below ground surface, sample of sand beneath surficial till soils.	3.5	0.54U	5.4U
EP-22 @ 10	Exploration Pit EP-22, 10 feet below ground surface, sample of sand beneath surficial till soils.	3.1	0.54U	5.4U
EP-23 @ 10	Exploration Pit EP-23, 10 feet below ground surface, sample of sand beneath surficial till soils.	4.6	0.54U	5.4U
EP-24 @ 10	Exploration Pit EP-24, 10 feet below ground surface, sample of sand beneath surficial till soils.	6.9	0.58U	5.8U
EP-25 @ 10	Exploration Pit EP-25, 10 feet below ground surface, sample of sand beneath surficial till soils.	3.1	0.54U	5.4U
EP-26 @ 10	Exploration Pit EP-26, 10 feet below ground surface, sample of sand beneath surficial till soils.	3.3	0.54U	5.4U
EP-27 @ 10	Exploration Pit EP-27, 10 feet below ground surface, sample of sand beneath surficial till soils.	4.0	0.56U	5.6U
EP-28 @ 10	Exploration Pit EP-28, 10 feet below ground surface, sample of sand beneath surficial till soils.	2.2	0.52U	5.2U
G-1	Grab sample from existing vertical cut into native sands.	1.6U	0.53U	5.3U
G-2	Grab sample from existing vertical cut into native sands.	2.2	0.53U	5.3U
G-3	Grab sample from existing vertical cut into native sands.	1.6	0.53U	5.3U
G-4	Grab sample from existing vertical cut into native sands.	1.8	0.54U	5.4U
OBW-6 @ 95	Observation Well OBW-6, approximately 95 feet below ground surface, sample of sand.	1.9U	0.63U	6.3U
OBW-7 @ 270	Observation Well OBW-7, approximately 220 feet below ground surface, sample of sand.	2.4	0.67U	6.7U

Table 10-2. Continued

		Arsenic	*Cadmium*	*Lead*
	Median	3.1	n/a	n/a
	Mean	3.27	n/a	n/a
	Standard Deviation	1.29	n/a	n/a
	Puget Sound Background[c]	7	1	24
	MTCA Method A[d]	200	10.0	1,000

a All units are mg/kg, parts per million (ppm).

b U indicates that the analyte was not detected at the stated value.

c 90th percentile levels from Ecology Publication #94-115, *Natural Background Soil Metals Concentrations in Washington State.*

d MTCA cleanup values shown are for industrial sites.

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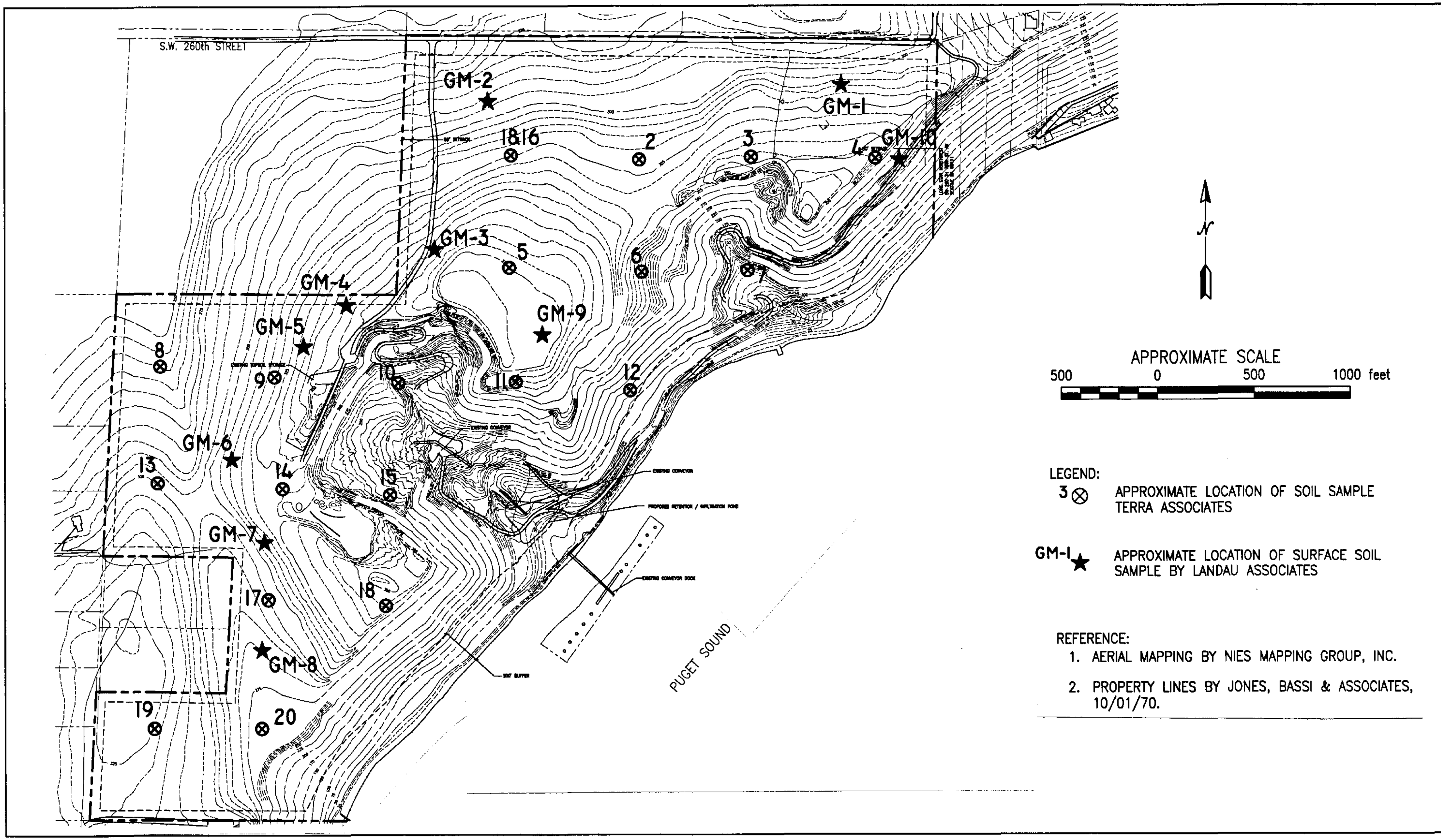

Figure 10-1. Locations of Surface Soil Samples

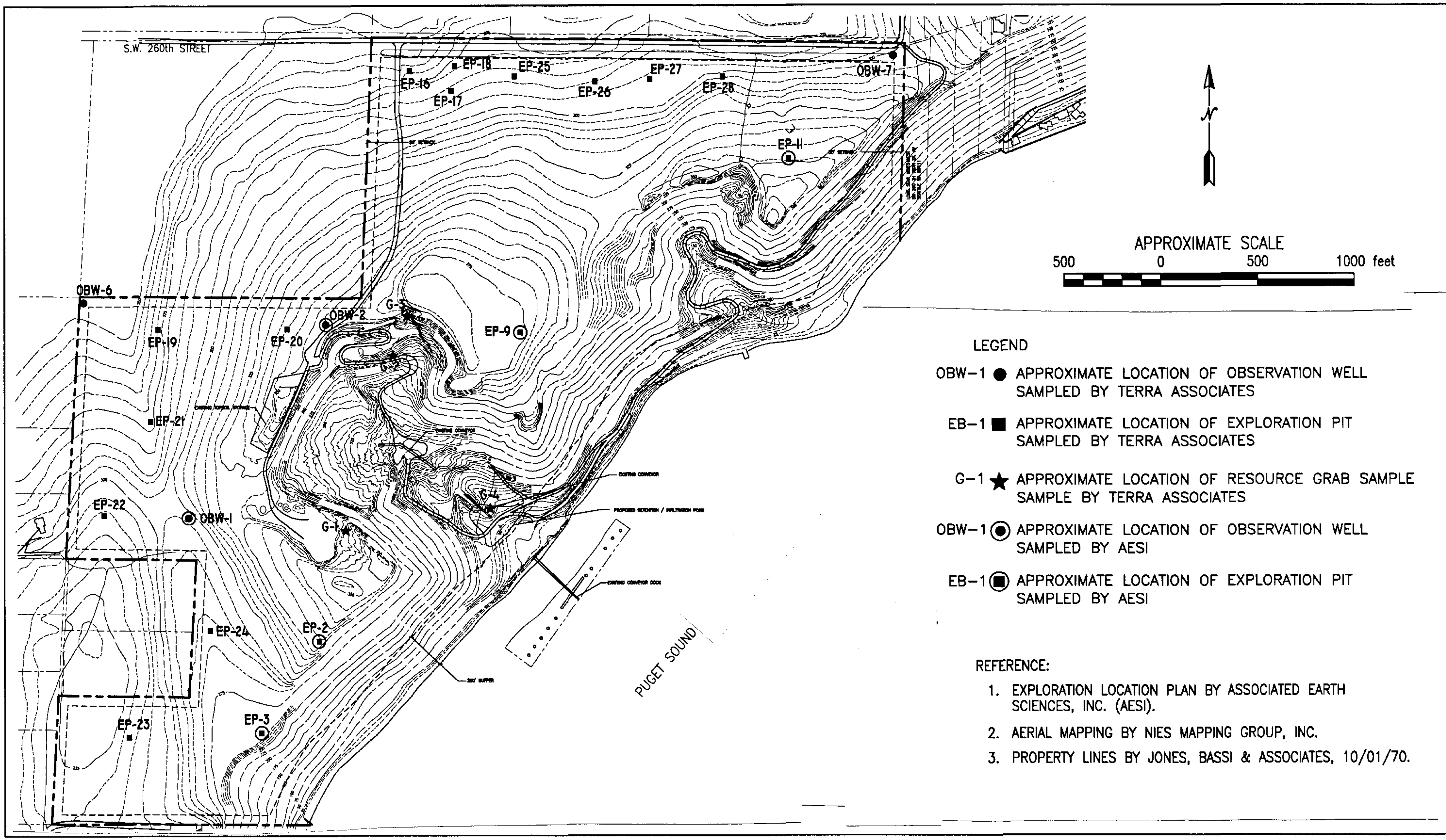

Figure 10-2. Locations of Subsurface Resource Samples

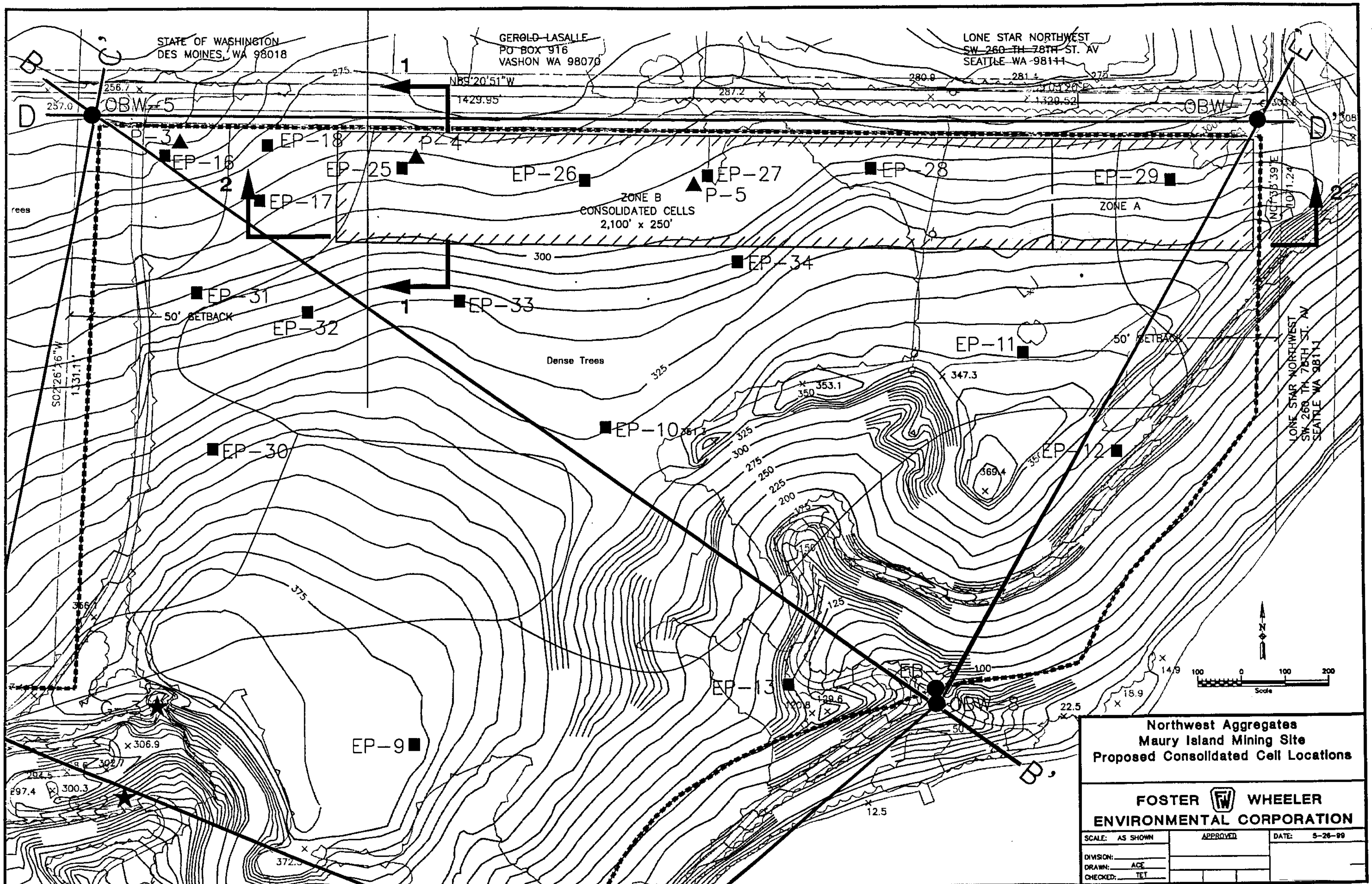

Figure 10-3. Proposed Consolidated Cell Locations

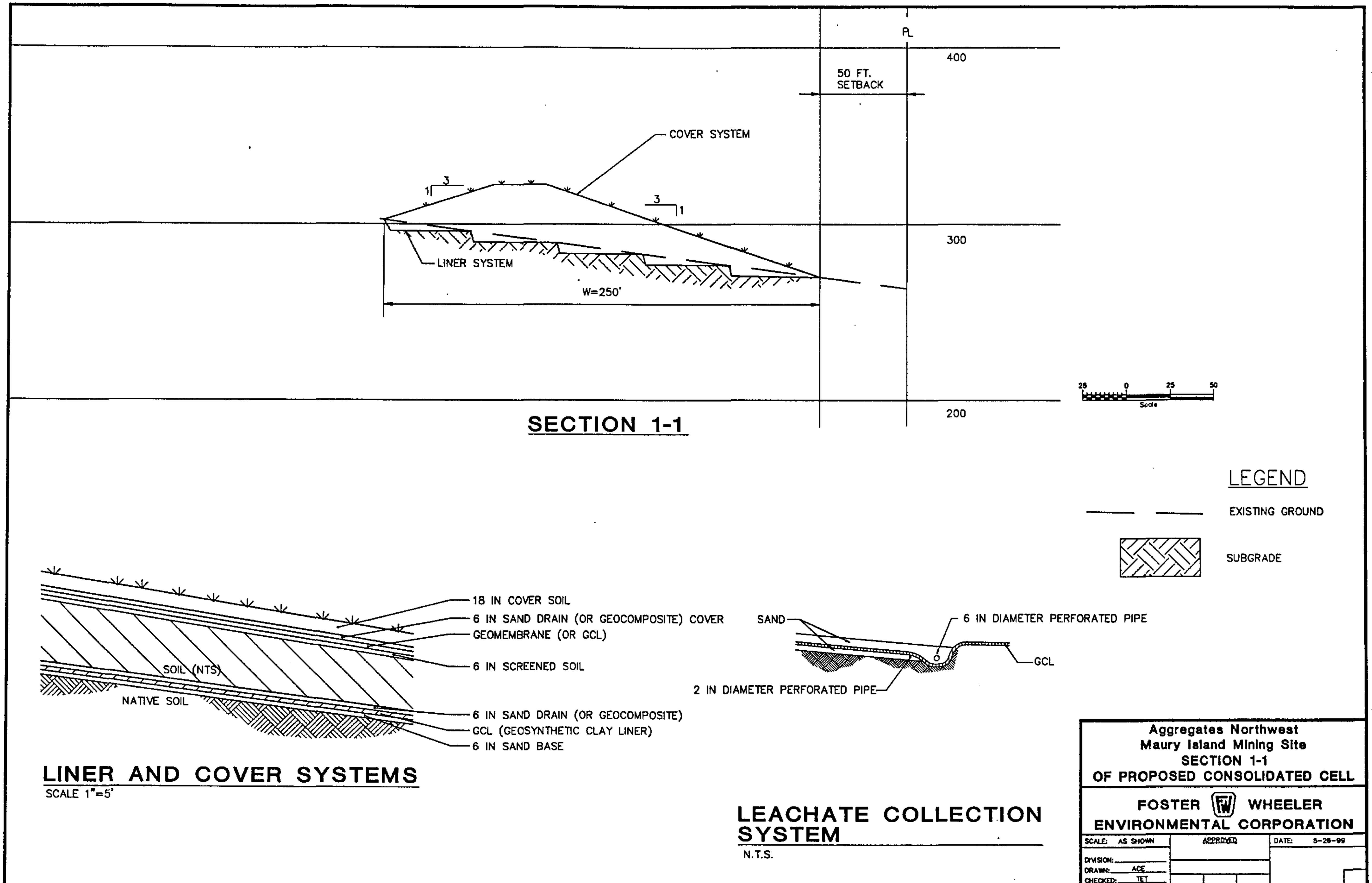

Figure 10-4. Section 1-1 of Proposed Consolidated Cell

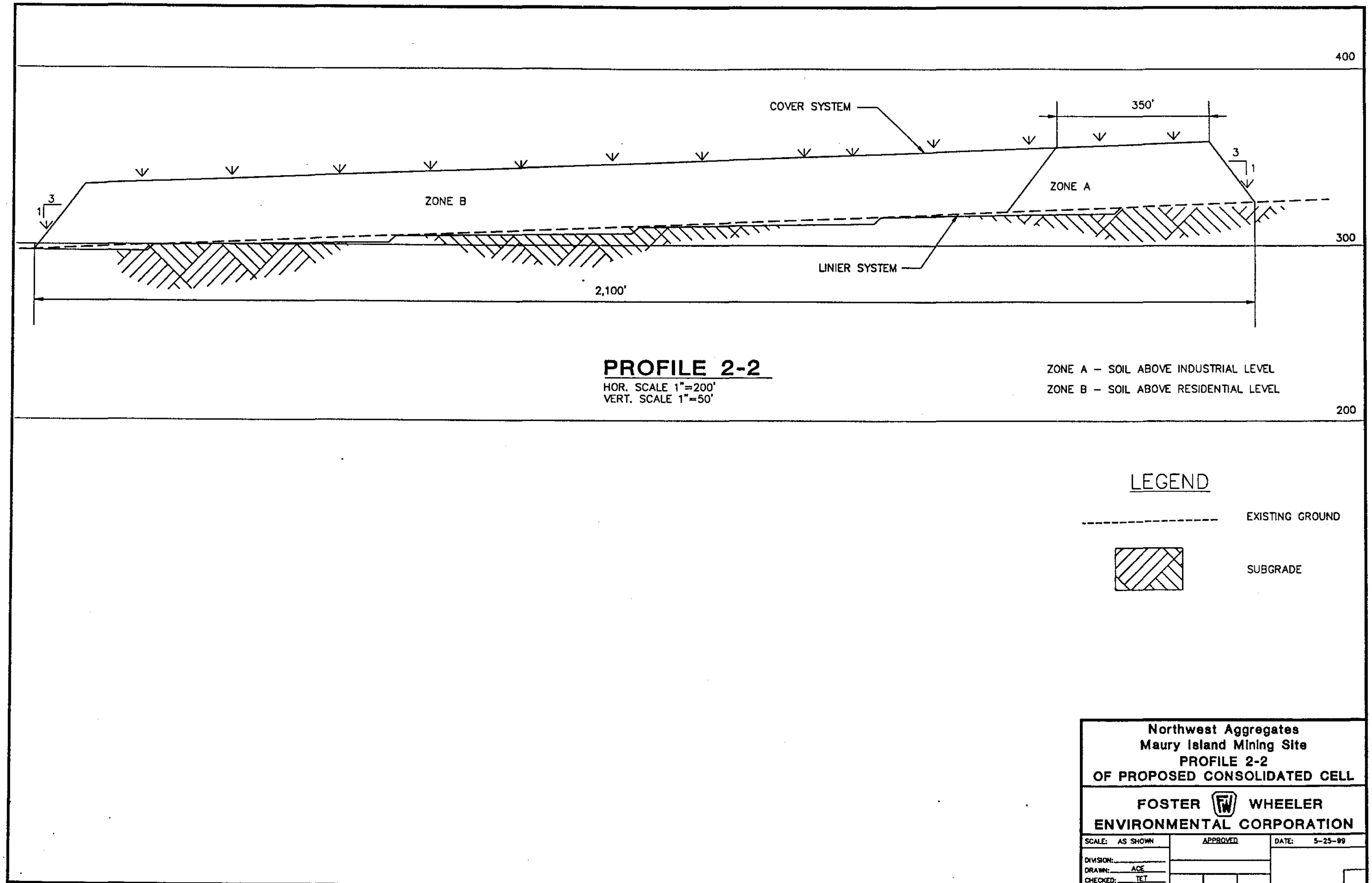

Figure 10-5. Profile 2-2 of Proposed Consolidated Cell